Hip Injuries

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Contributors

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Overview

Hip injuries are very common among the athletic population, accounting for around 6% of athletic injuries (1) There is a broad list of differentials for hip pain in the athletic patient, divided into intra-articular and extra-articular pathologies. This resource will focus on some of the intra-articular causes including labral tears, femoroacetabular impingement (FAI) and osteoarthritis (OA). The hip joint is a synovial joint that undergoes extreme forces with athletic activity, proven to bear loads of eight times body weight during jogging (2). The structure of the hip is uniquely adapted to bear these forces, while at the same time being able to move in triplanar manner. One in four adults develop symptomatic hip osteoarthritis in their lifetimes (3), making it a significant issue with this joint.

Anatomy

The hip joint (femoroacetabular joint) is formed by the head of the femur and the acetabulum of the pelvis. The acetabulum is formed by a fusion of the three bones of pelvis - the ilium, ischium & pubic bone. The femoral head forms the 'ball' and lies within the acetabular socket. Hyaline cartilage immediately surrounds the bony surfaces of the femoral head and acetabulum with the labrum (composed of a type 1 collagen fibrocartilaginous ring) surrounding the acetabular cartilage. The main blood supply to the femoral head and neck is from the retinacular branches of the medial and lateral circumflex arteries (branches of the deep femoral artery). The three extracapsular hip ligaments (iliofemoral, pubofemoral and ischiofemoral) are the strongest in the body to account for the extremes of force transmitted through the joint. In a similar fashion the muscles of the hip joint have to operate over a very short lever arm, despite demands for high power output (2).

By deepening the socket, the labrum acts to create a joint seal thus stabilizing the joint. It also increases the surface area for load transmission and can act as a distributor and container of synovial fluid. The labral tissue has limited healing potential (4) as only the outer third of the labrum is vascularized.

Femoroacetabular impingement (FAI) is generally categorized into three anatomical classifications. The first type (more common in younger males), cam impingement (Fig 1), results in an overgrowth of the femoral head, which abuts against the normal acetabular rim in flexion. Type 2 (more common in middle aged females) is pincer impingement (Fig 2), associated with an overgrowth of the acetabular rim, abutting with a normally developed femoral head. The third type is a mixed picture (Fig 3) with elements of both cam and pincer impingement.

FAI is not pathological itself, but a variation of normal bone structure. It only becomes pathological when the patient starts to experience in symptoms as a result of this bony variation (5). 20% of population have FAI yet only 23% of these complain of symptoms/hip pain (6).

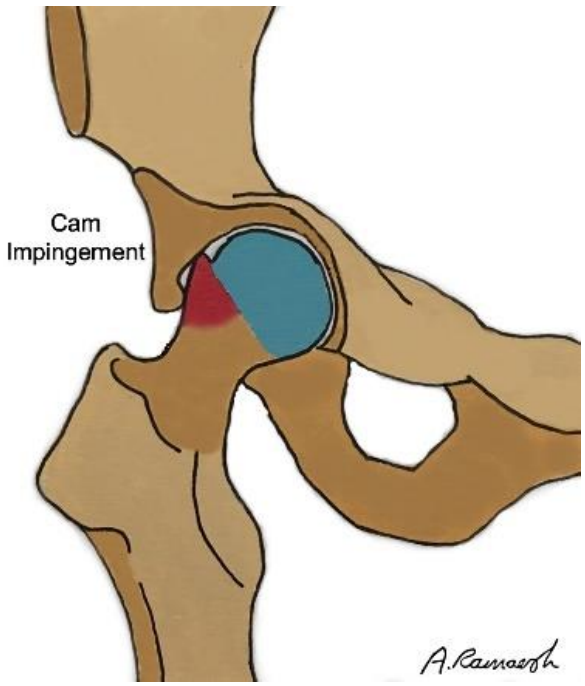

Figure 2. Cam Impingement

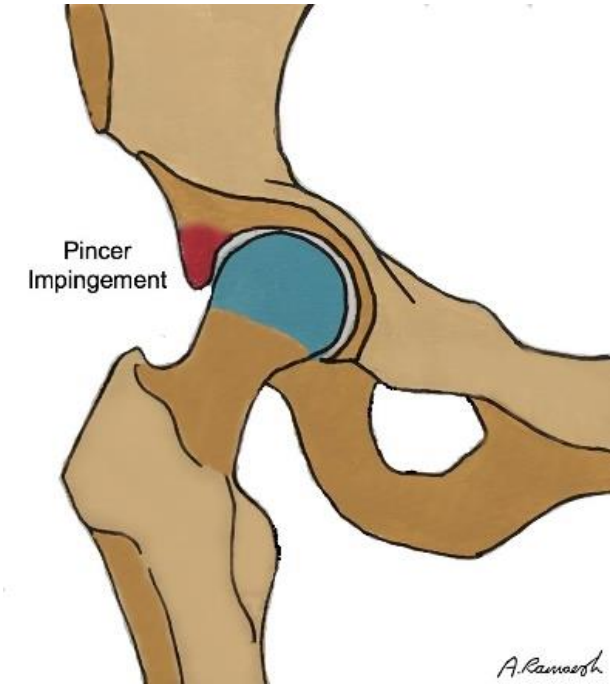

Figure 1. Pincer Impingement

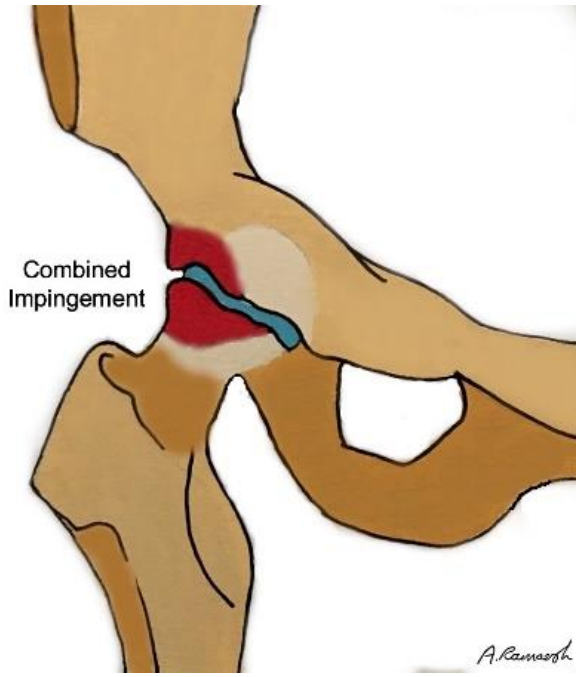

Figure 3. Mixed cam and pincer impingement

Aetiology

Labral tears are common in both asymptomatic and symptomatic hips. McCarthy et al (7) reported a 55% prevalence in patients with mechanical hip pain, whereas Silvis et al (8) reported a 56% prevalence in asymptomatic ice hockey players. Rarely labral tears can occur from isolated trauma, but the majority of tears occur in relation to an underlying anatomical abnormality causing repetitive microtrauma, such as FAI, developmental dysplasia of the hip, Legg-Calvé-Perthes disease and acetabular retroversion (4). The health of the labrum can also be affected by progression of the degenerative process of osteoarthritis of the hip (9). Traditionally there are two types of labral tears based on location. Type 1 is a detachment of labrum from underlying hyaline cartilage. Type 2 is a tear within the labrum itself. This distinction can be important (along with the labral blood supply) when considering potential of the tear to heal.

The anatomical pathology in FAI does not directly cause symptoms; instead, the repetitive impingement on surrounding structures such as the labrum and chondral surfaces leads to pain. This repetitive damage to the chondro-labral junction can cause chondral defects, which eventually contribute to the onset of osteoarthritis of the hip (10). Kowalckuz et al. found a significant correlation between FAI and osteoarthritis, where an alpha angle >60˚ (Figure 4) predisposed to significant OA requiring total hip replacement (11).

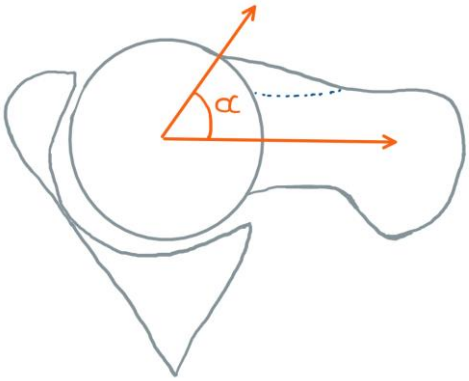

Figure 4- The alpha angle is the angle between a line through the center of the femoral head down the center of the neck, and a line from the center of the femoral head to the head and neck junction

Osteoarthritis, often referred to as 'wear and repair' process, can develop in many joints but clinically the hip is one of the most affected (12). It is characterized by cartilage loss, remodelling of the bone and surrounding inflammation (13). Both labral tears and FAI can contribute to the development of osteoarthritis. It is important to note that OA is NOT directly caused by ageing but that ageing is a risk factor.

The specific risk factors for hip OA include;

- Genetics
- Constitutional factors (ageing, female, obesity, high bone density)
- Biomechanical factors – previous injury, occupation, joint laxity, reduced muscle strength, joint malalignment)

Clinical Features

Intra-articular hip pathology can manifest itself through a number of symptoms including pain, clicking, catching, locking and giving way. The pain from an intra-articular hip condition can vary in site including anterior thigh, groin, knee and the lateral aspect of the hip (the classic 'C' sign) *(14).* Burnett et al (15) found that 92% of their cohort with labral pathology presented with groin pain. FAI also often manifests as groin pain, particularly in deep flexion (10). The pain from osteoarthritis tends to be chronic with associated intermittent acute flare ups. Patients may describe intermittent pain which can be worse when attempting to move after a period of inactivity. However, if the patient continues to move the pain is reduced. OA pain is often worse at the end of the day or even at night.

Clinical assessment of the hip will often start with an assessment of the patient's gait. To help differentiate intra-articular from extra-articular hip pathology palpation for points of tenderness is useful especially along the proximal adductor muscles, the pubic tubercles and pubic symphysis as well as the iliopsoas muscle belly. A cough test to rule out any hernias is also helpful. Movement of the joint is essential to assess range of motion (ROM) alongside a comparison to the patient's normal side to establish their baseline. Normally the ROM for hip flexion is 110-120˚, external rotation 40-60˚ and internal rotation 30 - 40˚ (15). Assessments of the joint above (Lumbo-sacral spine) and below (knee) are key components to any joint examination.

Clinical tests can be useful to determine the cause of hip pain. The FADIR test is quite sensitive for anterior FAI, where the examiner passively flexes (to 90 degrees.), adducts and internally rotates the patient's hip to elicit the pain. Pain tends to occur in the groin region. FABER is where the examiner abducts and externally rotates the patient's hip to elicit pain around the anterior hip. This also sensitive for labral pathology (16). It is worth noting that FABER test can also be used to assess for Sacroiliac (SI) joint pathology. The difference is that the pain will be elicited around the SI joint.

NICE guidelines (13) for osteoarthritis state that OA (of any joint) can be diagnosed clinically if a patient is:

1) 45 or over.

2) has activity related joint pain, and.

3) has either no morning joint-related stiffness, or morning stiffness that lasts no longer than 30 minutes.

A differential diagnosis for intraarticular hip pain apart from OA, FAI & labral pathology would include; femoral neck stress fracture, inflammatory arthritis, septic arthritis, Avascular necrosis of the femoral head, tumour, Slipped Upper Femoral Epiphysis (adolescents) and Perthes disease (children).

Investigations

Radiographs to investigate certain hip pathologies can be useful, such as for FAI and OA, and can help to narrow down differentials. Anteroposterior, lateral and Dunn's views are the most commonly used, as well as the frog-leg view in a paediatric population. Osteoarthritis presents radiographically with loss of joint space, subchondral sclerosis and the presence of osteophytes and subchondral cysts. However, often radiological features do not correlate well with the clinical manifestation and degree of pain (13). Osteoarthritis of the hip is generally classified radiographically and pre-operatively by the Tonnis grading system compared to the Outerbridge classification, which is used intra-operatively to grade the severity of chondral damage (17).

Sometimes the diagnosis of intra articular hip pathology is difficult to distinguish from extra articular causes; this can be resolved with a fluoroscopically guided injection of local anaesthetic into the hip joint. A positive response to the injection narrows down the differential to intra-articular abnormalities such as labral tears or FAI (9).

FAI can be diagnosed morphologically with some radiographic parameters. An alpha angle on a lateral radiograph above 55˚ indicates cam morphology. This is the angle between a line running down the center of the femoral neck and a line from the center of the femoral head to the point where the head becomes aspherical. Lateral center edge angle is between a line that runs from the center of the femoral head to the edge of the labrum and a line that is perpendicular to the transverse pelvic axis (between the two pelvic rami). A lateral center edge angle above 40˚ (Figure 5) indicates over coverage and therefore pincer type.

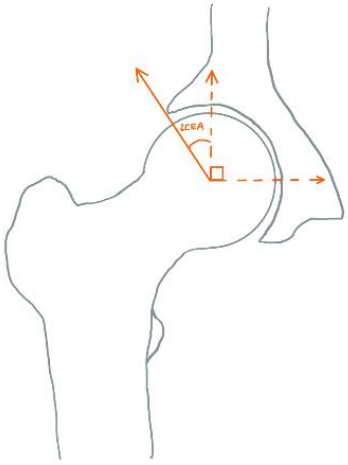

Figure 5- The LCEA is the angle between a line, perpendicular to the horizontal axis of the pelvis, through the femoral head and a line from the center of the femoral head to the edge of the acetabulum.

Whilst FAI can be assessed radiographically on plain film radiographs, labral tears are better assessed using an MR arthrogram (10), when contrast is injected directly into the joint space under fluoroscopic guidance. The gold standard investigation for diagnosing labral tears remains a hip arthroscopy but an MR arthrogram is generally performed first as it has reasonable sensitivity and specificity and is far less invasive (18).

Management Options

The Osteoarthritis Research Society International (OASRI) suggests a combination of non-pharmacological and pharmacological treatments before surgery would be considered in OA (19). Patients should be advised to a combination of weight bearing & non-weightbearing exercise in order to improve their muscle strength around the hip as well as their core aerobic fitness (13). Along with exercise, weight loss can be crucial for managing symptoms in patients that are overweight.

Pharmacological management can be useful in hip OA; paracetamol and topical NSAIDs are first line, with oral NSAIDs, COX-2 inhibitors and opioids as second line treatments (13). Intra-articular joint injections may provide short-term symptom relief in some patients with moderate to severe symptoms but are not a long-term solution. Transcutaneous electrical nerve stimulation (TENS), thermotherapy and manual therapy can be used as adjunctive treatments (13).

End stage degeneration of the hip joint is mainly treated with total hip arthroplasty (THA) (3) but there are often future implications for use of the joint and requirements for revision surgery which need to be factored into the clinical decision making, alongside all the usual risks of surgery such as infection, chronic pain and damage to surrounding structures.

Conservative management for FAI, such as activity modification and analgesia, has limited success but should be considered first line (10). This includes addressing risk factors (e.g., load management, type of movements required, hip movements during functional assessment and addressing proximal factors like lumbar hyperextension or pelvic tilt), limiting time in the impingement position and maximizing dynamic neuromotor control (through strengthening the deep hip stabilizing muscles). Surgical management includes arthroscopic surgery or an open approach, with arthroscopic techniques now being favoured for their minimally invasive approach and faster rehab times (10). In the athletic patient, return to sport can be a major concern to the patient, but a systematic review by O'Connor et al (20) demonstrated a return to play rate of 84.6% in all levels of athletes after hip arthroscopy.

Conservative management is often the first approach for labral tears, with analgesics and NSAIDs often used alongside physical therapy, however there is a lack of evidence in the literature for the efficacy of these treatment options (4). Most physical therapy protocols follow a 3-phase template of unloading with associated improvement of joint range of motion and strengthening, functional movement and sport-specific exercise (21). Failing conservative treatment, operative treatment is often the next option with arthroscopic approaches favoured. There are two options, either resection/debridement of the torn labrum or repair using sutures. Often repair is favoured due to better long-term outcomes (most notably less risk of cartilage degeneration) (22). Repair has, however, a longer post-operative recovery phase.

The close aetiology between FAI and labral tears often means patients present with aspects of both pathologies. Often repair of a labral tear & its associated FAI will include femoroplasty to reshape the femoral head-neck junction. (4) This is to correct the bony abnormality and remove the underlying mechanism of labral injury.

Long-term results after treatment of labral repairs are unclear. McCarthy et al (23) looked at predictive factors for Total Hip Arthroplasty (THA) in a cohort followed up 10 years post arthroscopy. They concluded that labral tears associated with low grade chondral lesions (Outerbridge grade I or II) are effectively treated with hip arthroscopy, whereas age > 40 years and an Outerbridge grade III or above were risk factors for conversion to a THA.

Prevention

Ensuring that the deep hip stabilizers have optimum strength can minimize the stress on deeper structures like the labrum and acetabular rim (6). Currently there is a lack of evidence that any prophylactic arthroscopic surgery for FAI is indicated. There is no literature to suggest that asymptomatic patients with radiographic evidence of FAI are at increased risk of premature osteoarthritis (24). Higher quality evidence is needed to answer this question in the future.

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